

## Effect of Photoperiod on the Development of *Spermophora senoculata* (DUGÈS) (Araneae:Pholcidae)

Kazuyoshi MIYASHITA<sup>1)</sup>

宮下和喜<sup>1)</sup>: シモングモの発育に及ぼす光周期の影響

**Abstract:** The nymphs of *Spermophora senoculata* (DUGÈS) were reared under 3 different photoperiods; natural, long (LD-16:8) and short (LD-10:14). Upon rearing under natural and long photoperiods, there was no difference in the developmental process. Upon rearing under a short photoperiod, however, development showed a retardation of 50–70 days due to prolongation of all instars other than the last one as compared with that under the other conditions.

### Introduction

Although the spider *Spermophora senoculata* (DUGÈS) lives behind fallen timber or rocks in woods, it often settles in buildings, especially in dark places behind furniture or even in closets. In connection with this characteristic habitat preference of the spider, I investigated the effect of photoperiod on the development of its nymphs by means of a rearing experiment under indoor conditions.

### Materials and Methods

A female with an egg-sac was collected in the animal rearing room of our school on 9 October, 1988. Nymphs emerged from the egg-sac on 20 October. After molting on 30–31 October without feeding, the nymphs were kept individually in screw-topped glass vessels, 2.5 cm in diameter and 5.7 cm in height. A slip of thick paper was placed in each vessel as a foothold for the spider, and the vessels were placed upside-down. Rearing was started on 4 November. Nymphs were provided prey at intervals of 3–4 days. Prey provided were *Sinella cuspidatus* (Collembola) and *Drosophila melanogaster* (Drosophilidae) adults, provided alternately. The number of prey was increased from 1–2 to 2–3 as the development of the experimental animals proceeded. The nymphs were divided into 3 groups for rearing under 3 different photoperiods, i.e., natural, long (LD-16:8) and short (LD-10:14). Natural photoperiod was defined as the natural

---

1) Department of Biology, Faculty of Science, Tokyo Metropolitan University, 2-1-1 Fukazawa, Setagaya-ku, Tokyo, 158 Japan

東京都立大学理学部生物学科 〒158 東京都世田谷区深沢 2-1-1

lighting conditions present in a corridor protected from direct sunshine and artificial light, where the spiders were placed. Day length was 11 h 41 min on 4 November, 1988 (start of rearing), 10 h 56 min on 22 December (winter solstice) and 13 h 04 min on 20 March, 1989 (end of rearing under natural photoperiod). Long and short photoperiods were created by switching on and off a 4-W fluorescent tube in a wooden box, 60 cm wide, 45 cm deep and 45 cm high, the tube giving 250–300 lux. The boxes were placed near the site of rearing under natural photoperiod. Seven nymphs were used in each rearing.

Temperature and humidity were not controlled, and were considerably influenced by steam central heating of the school building during the period from November to March.

### Results and Discussion

Figure 1 shows the results of rearing under 3 different photoperiods. One individual reared under a long photoperiod died during the course of the experiment, and was therefore omitted from the graph.

Upon rearing under a natural photoperiod, the nymphs developed into adults in 113–136 days, the calculated mean being  $124.6 \pm 8.3$  days. The nymphs reared under a long photoperiod

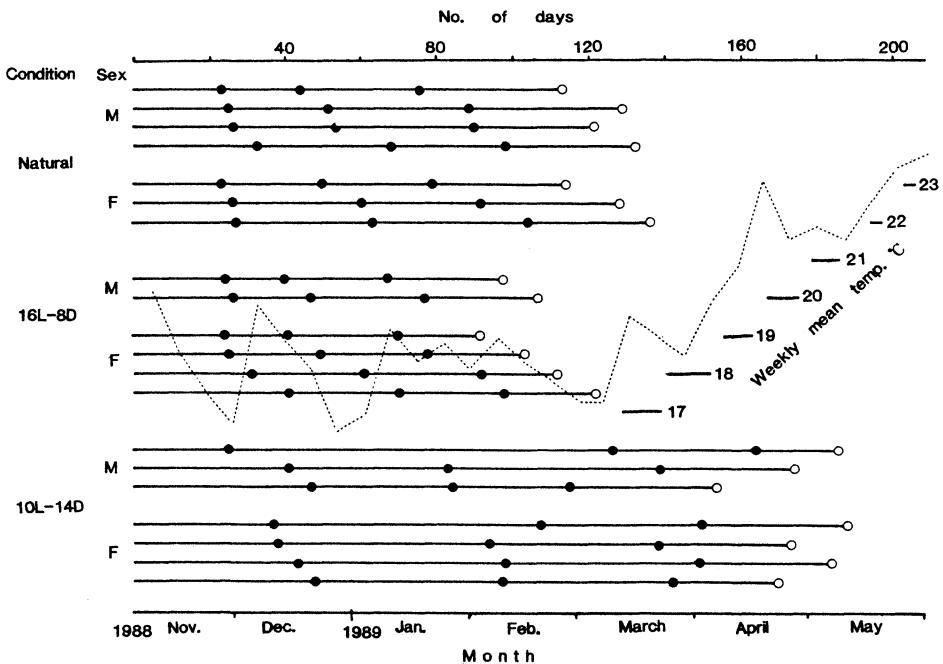


Fig. 1 Developmental process of *Sperophola senoculata* nymphs under natural, long (LD-16:8) and short (LD-10:14) photoperiods. Black circles indicate moltings, and white ones final molting. Dotted line shows weekly mean temperature.

did so in 92–122 days with a mean of  $105.5 \pm 9.8$  days. The mean developmental period to adulthood was 19.1 days longer in the former as compared with the latter ( $P < 0.01$  by t test). This was because of the shortening of the last instar under a long photoperiod ( $P < 0.01$  by t test).

Upon rearing under a short photoperiod, the nymphs required 154–187 days for development to adulthood with a mean of  $175.4 \pm 10.8$  days. This mean developmental period was significantly longer than that for rearing under natural and long photoperiods ( $P < 0.001$  by t test). Since temperature and humidity were not controlled, it is certain that this difference in developmental period resulted from the effect of short photoperiod. In other words, the development of this spider was retarded considerably under a short photoperiod, and this developmental retardation was manifested by prolongation of all instars other than the last one, since the calculated mean length of the last instar was not differed from that for rearing under a natural photoperiod ( $P > 0.2$  by t test). A similar developmental retardation under a short photoperiod has already been reported in *Dolomedes sulfureus* L. KOCH and *Xysticus croceus* FOX by MIYASHITA (1986 and '89), but the degree of developmental retardation observed in *S. senoculata* was not as intense as in the above 2 species. In contrast, some species are known to develop almost equally under long and short photoperiod, including *Achaearanea tepidariorum* (C.L. KOCH) and *Pholcus phalangioides* (FUESSLIN) (MIYASHITA, 1987 and '88).

Since this experiment was conducted mainly in winter, it appears that nymphs of this spider that settle in buildings are able to continue their development throughout winter, when food is available. In addition, artificial heating and lighting would accelerate development rather than inhibit it, and this appears to be why this spider often invades and successfully settles in buildings.

### Acknowledgments

I express sincere thanks to Mr. Eiichi SHINKAI for identification of the experimental animal. This study was supported partly by Grants-in-aid No. 01540552 for 1989 and 1990 from the Ministry of Education, Science and Culture of Japan.

### 摘 要

シモングモの幼生を、自然、長日、および短日の光周期条件下で飼育したところ、自然および長日条件下での発育はほぼ同じであったが、短日条件下では50~70日遅れて成体になった。この発育の遅れは、最終齢以外の各齢期間が延長したことによるものであった。

### References

- MIYASHITA, K., 1986. Developmental retardation in *Dolomedes sulfureus* L. KOCH (Araneae: Pisauridae) under short photoperiod. *Acta Arachnol.*, 35: 11–14.  
——— 1987. Development and egg-sac production of *Achaearanea tepidariorum* (C.L. KOCH) (Araneae,

K. MIYASHITA

- Theridiidae) under long and short photoperiods. *J. Arachnol.*, 15: 51–58.
- 1988. Development of *Pholcus phalangioides* (FUESSLIN) (Araneae, Pholcidae) under long and short photoperiods. *J. Arachnol.*, 16: 126–129.
- 1989. Effect of photoperiod on the post-overwinter development of a crab spider, *Xysticus croceus* FOX (Araneae, Thomisidae). *Bull. Br. arachnol. Soc.*, 8: 61–63.